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ABSTRACTS OF WATER WORKS LITERATURE

Double Check Values. Eng. News-Rec., July 7, 1921. Hartford, Conn., voted, in 1920, to abolish and prohibit all connections between the public water supply and other sources of supply, including double check valve connections of all kinds.—*J. N. Chester.*

Electrolysis. Eng. News-Rec., July 7, 1921. Conditions relieved in Winnipeg by three-wire system for electric railway, reducing cable drainage current over 60 per cent.—*J. N. Chester.*

Friction Loss in Spiral Pipe.—Eng. News-Rec., July 28, 1921. Experiments at Purdue University show that the friction loss in galvanized, spiral riveted, steel pipe is nearly the same as for smooth cast iron pipe when the flow is with the laps. Spiral pipes should be laid so that the flow is with the laps—*J. N. Chester.*

Manning and Kutters Formulae. Eng. News-Rec., July 21, 1921. Study of gagings in Chicago Sanitary District indicates "Manning formula better than Kutters" for 'n' except when 's' terms omitted.—*J. N. Chester.*

Tastes in Marquette, Mich. water. Eng. News-Rec., July 14, 1921. Investigations show that tarry waste products from wood alcohol manufacturing create the offensive tastes in Municipal water at Marquette, Mich. Removal at source only practical solution and the company is preparing to convert tar wastes into liquid fuel by evaporation to 25 per cent.—*J. N. Chester.*

Treatment of Water Gas Waste. Eng. News-Rec., August 4, 1921. Water gas wastes at Flint, Mich., have been treated experimentally with lime as a coagulant, removed through coke filters.—*J. N. Chester.*

Five Years Sanitary Progress. West Virginia State Board of Health-Reports. Report for 1915–1920 shows marked reduction in typhoid toll by chlorination and further reduction by filtration and chlorination. 1919–1920 Annual Report, gives a history of the State Board of Health, since established in 1881.—*J. N. Chester.*

Rural Water Supplies. Mississippi State Board of Health, Health Bulletin, Special Bulletin No. 16. The paper sets forth in simple manner the means of securing pure water supply and of safeguarding the same against contamination. Drawings are given illustrating satisfactory and unsatisfactory conditions. The diseases which are most apt to be water-borne in Mississippi are typhoid fever, various types of dysentery and diarrheas, and several varieties of intestinal worm infections or parasitic diseases. Common among this latter class are the ordinary round worm, or stomach worm, the hook worm, the parasite causing amoebic dysentery, etc.—*A. L. Fales.*

Milwaukee Water Supply. H. P. Eddy. Eng. News-Rec., July 7, 1921. On Milwaukee controversy, Mr. Eddy urges immediate plans for water purification plant regardless of new sewage works because of storm over-flows and other contamination not controlled by sewage plant. Recommends laboratory investigations in colloidal chemistry, which might reduce capacity requirements for coagulation and fitration.—*J. N. Chester.*

Report of Division of Water and Sewage. Montana State Board of Health, Report for the Years 1919 and 1920. W. N. Cobleigh. Based on field inspections and analyses the public water supplies are classified as "approved" or "unapproved." Definite recommendations for improvement, are made for the latter class. There are 112 public water supplies in the state, of which 42 are owned by private companies and 70 by municipalities. Of the total supplies, 19 have not yet been classified. Of the remaining, 14 were approved and 15 more have now been approved because of the installation of purification plants. The classification of 6 purification plants has been deferred pending the making of recommended improvements. Of the purification plants one has filtration only, 8 have filtration and disinfection with liquid chlorine, and 16 have only disinfection. Plans and specifications for proposed water systems were received from 13 municipalities. A total of 31 drinking water supplies for common carriers are examined every six months.—.*A L. Fales.*

Evaporation from Gatun Lake, Panama Canal Zone. J. E. Hughes. Engineering and Contracting, August 10, 1921. Approximately 62 inches evaporate from Gatun Lake surface in a calendar year. During the dry season from January 1 to May 1, 1921, the evaporation amounted to 24.46 inches. The method of measuring rainfall and evaporation is described in detail.—*A. L. Fales.*

The Production of Wholesome Water for Municipalities. Lewis O. Bernhagen. Texas Bur. San. Eng. Pub., November 4, 1920. The purpose of this pamphlet is to present in condensed form information which will be of assistance to the operators of water filtration and sterilizing plants where no regular chemist or bacteriologist is in attendance. It deals with the collection of samples, methods of analysis and interpretation of results, sources of supply, construction and operation of mechanical filter plants and chlorination apparatus. An appendix of useful information is given.—*A. L. Fales.*

Report on Examination and Control of Water Supplies. Charles B. Howard. New Hampshire State Board of Health, Report for Fiscal Years of 1919 and 1920. The total number of water samples examined during the two years amounted to 1939 of which 849 were from public systems, 230 from sources of public interest furnishing water to factories, hotels, schools, etc., and 860 from private sources. Of the latter approximately two-thirds failed to represent water of entirely acceptable quality, due in large measure to failure to keep the source clean, or to the entrance of surface drainage. Of 33 railroad supplies requiring certification to the U. S. Public Health Service, two were condemned and discontinued. The total number of supplies subjected to purification treatment on September 1, 1920 was 13, including 7 filtration plants of which five have chlorination, and five plants using chlorination only, of which two use hypochlorite instead of liquid chlorine. Improvements are advised for several treatment plants and treatment is recommended for 5 supplies not now treated. With reference to connections with polluted secondary supplies at factories, the Department insists on two checks in series of approved construction, installation in such manner as to be readily accessible for examination and test, and inspection as to working condition at least twice annually. The Department has uniformly required that the supply for drinking and ablutionary purposes for the operatives, shall be from a special line from the street main, independent of the fire system.—*A. L. Fales.*

Water Softening and Purification at Columbus. Public Works, August 13, 1921. Typhoid death rate reduced more than 90 per cent by the introduction of filtered water. Charles P. Hoover, chemist, has been experimenting with addition of acids to the softened water to reduce its tendency to form incrustations on the filter sand and in the distribution system. The addition of 0.7 grains per gallon to the water of phosphoric acid made by boiling Tennessee rock phosphate in sulphuric acid is now being tried on a large scale.

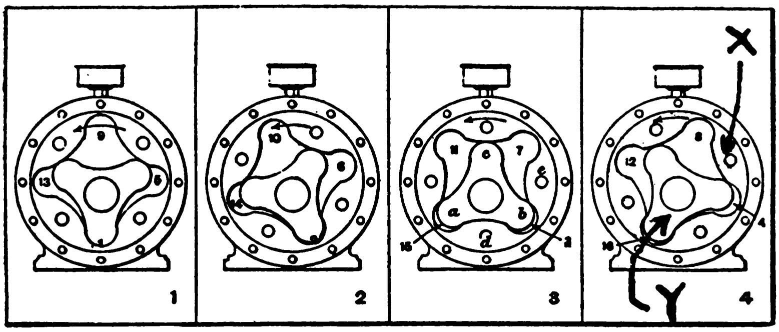
Water Waste Control. Eng. News-Rec., August 4, 1921. By partly closing during the night, all main valves on the distribution system, London, England, the water consumption was reduced 12½ per cent.—*J. N. Chester.*

Engineering Developments in British South Africa. R. A. LUNDQUIST. Bull. Minnesota Federation of Arch. and Eng. Soc. Aug., 1921. Although water service is available in the larger towns, the supply is generally short and restrictions are placed upon its use. Very little attention is given to the question of purity and in most cases it is unsafe to drink the water until boiled.—*A. L. Fales.*

Illinois State Department of Public Health, Annual Report, 1919-1920. Division of Eng. and Sanit. HARRY F. FERGUSON. The activities of the Division in the examination of water supplies and investigations and advice relative to existing or proposed supplies, including purification plants, are described. The work of examination and certification of water supplies, for the United States Public Health Service, used on interstate common carriers, has been extended to include intrastate carriers, also, and attention has been given to the method of handling the water from the sources to the car tanks. During the fiscal year 83 places in which one or more watering points are located, were inspected, and 693 samples analyzed. This work has brought about improvement in many private sources of water supply as well as calling attention of officials to defects in public water supplies. The most important investigation of water-borne epidemic, in which the Division coöperated with the Division of Communicable Diseases, was the outbreak of typhoid fever which occurred among the employes at the shops of the Chicago and Alton Railroad at Bloomington. This epidemic which comprised over 200 cases, with 24 or more deaths, was due to interconnection with a contaminated water supply. This interconnection was abandoned and a new distribution system installed.—*A. L. Fales.*

Exeter Rotary Pump. Nautical Gazette, 101, 19, 597-609. May 7, 1921. The Exeter Rotary Pump built under the Feuerheerd patents has two rotating elements, an outer four lobe rotor X, driven by an inner three lobe rotor Y, set eccentrically to it. The irregular spaces between the two rotors increase and decrease in volume as the two rotate at slightly different speeds, and are utilized to admit and eject the fluid.

The pump has no valves, and being of the positive displacement type, is self priming. While the contact between the two rotors is of a rolling nature the pump has a large bearing surface between the outer rotor and the casing,



Cycle of Movement of the Rotors of the Exeter Pump

and close clearances must be maintained between the sides of the two rotors and the casing in order that the pump may function properly. For handling viscous liquids, oils, etc., this type of pump should find a considerable field of application.—*L. A. Quayle.*

Metropolitan Water Supply for the Twin Cities. John W. Kelsey. Bull. Minnesota Federation of Arch. and Eng. Soc., 6, 9, September, 1921. After considering available surface and ground water supplies the author concludes that main dependence should not be placed upon a well water supply, because of its hardness, the high cost of pumping and distribution, and the danger of such a supply becoming inadequate. From an economical standpoint he believes the only method of securing a metropolitan water supply would be to use the Mississippi River water. In his opinion the advantages of such a metropolitan supply, over independent supplies for the two cities, are offset by the disadvantages.—*A. L. Fales.*

Financing Municipal Water Supplies. W. D. P. Warren. Illinois Soc. of Eng., Annual Report. 1921. The State of Illinois has 12 cities with more than 2000 population and more than 600 cities and villages of less than 2000 population, without a public water supply. The author believes that a satisfactory water supply should be possessed by each city having a population over 1000 and by many smaller cities where the supply can be obtained without excessive cost. During the past few years few supplies have been installed and extensions to existing supplies have been inadequate in many places. At many plants the supply is of unsatisfactory quality and modern water purification plants are greatly needed. With the cost of materials high and the bonding capacity of many cities insufficient to meet the expense of proper improvements, the situation has become acute. A plan of securing an adequate water supply in a few cities has been brought about by a willingness on the part of local parties to invest in the securities of a water supply company formed for the purpose, or to assume responsibility otherwise for the payment of funds necessary to construct the improvement. The plan of three cities is described in detail.

The schemes considered by Ralph J. Monroe, Corporation Counsel for Decatur, are as follows: By a statute in 1899, the state authorized the construction or purchase of a water plant by a city and the issuance of water certificates bearing interest and secured by mortgage on the property constructed or purchased and payable out of the income of the property and from no other source. This method of financing is satisfactory only in cities which have no plant at all to begin with. All other schemes of financing municipal water supplies where the city is close to its debt limit, depend upon private capital, some of the common forms being, (a) Organization of a water supply company to construct and operate the plant, (b) Trustees to sell trustee certificates, purchase the property and lease it to the city, and (c) Contract with the construction company to build the plant and sell it to the city on a conditional sales contract. The first of these three plans is very desirable where it can be used, and forms the basis of the plan at Decatur. It has an advantage over the municipal water certificates first-mentioned, in that the corporation will hold the title to the property until paid for, and no foreclosure would be required. The trustee arrangement is the one commonly used and is very satisfactory except that if the investment is sufficiently large, inasmuch as the courts have indicated that the payment payable in any one year is a debt, it might be that the amount payable in any one year would in itself be a violation of the debt limit. This can be avoided by adding the quarterly installments payable in advance, as in the Decatur plan. The plan of letting a construction company build the plant has the advantage that such an agreement relieves the city administration and citizens from the worry and work of financing, but this relief will be dearly paid for as the contractor must be well paid for the risk and he will figure on a high discount rate. However, as a last resort the plan is better than none.

In view of the difficulty of putting any of these methods into practice in some municipalities, the author suggests that the legislature pass an act to create water districts, this act to be patterned after that passed by the Illinois Legislature in June 1917, to create sanitary districts and to provide for sewage disposal.—*A. L. Fales.*

Further Observations on Ph in Natural Waters. ABEL WOLMAN. AND FRANK HANNAN. Chem. and Met. Eng. 25, September 14, 1921. The article contains a valuable review of the recent scientific literature on the subject of hydrogen ion concentration and a discussion of the applications to be made to the problems of water purification. The experimental part includes observation on the hydrogen ion concentration of Lake Ontario water over a period of eleven months as well as similar data upon slow sand and mechanical filtration plants. The relations of temperature, pollution and filtration with hydrogen ion concentration are discussed.—*A. M. Buswell.*

Bactericidal Action of Water Treated by Ultra-Violet Rays. W. F. WALKER. AND R. W. PRYER. American Jour. Pub. Health, 11, 8, 701, August, 1921. The authors describe experiments conducted by them at Detroit, from which they conclude that the exposure of water to ultra-violet light emitted from a quartz mercury vapor arc, imparts to the water a definite residual bactericidal property which effects a reduction of at least 85 per cent of the organisms subsequently added, this property being dependent upon the energy input into the lamp and the time of exposure and accentuated in series installations. The usual pressure type of sterilizer operating on a 220-volt current develops the bactericidal property under ordinary working conditions.—*A. L. Fales.*

Report of Bur. San. Eng. June, 1921. California State Board of Health, Monthly Bulletin, 17, 2, August, 1921. This report lists the sanitary improvements being carried out by various California cities, and gives a summary of the Bureau's activities. Of special interest is a note relative to a case of arsenic poisoning traced to a spring the water of which gave a strong arsenic reaction.—*E. S. Chase.*

Typhoid Fever More Prevalent than in 1920. Illinois State Department of Public Health, Health News, 3, 10, October, 1921. Reports to the State Department of Public Health show an increase of typhoid over 1920, during June, July and August. The results of a large number of investigations indicate that much of the typhoid fever has been due to carriers.—*E. S. Chase.*

Chlorinated Water Not the Cause of Death of Citizen. Department of Health of the State of New Jersey. Public Health News, 6, 10, September, 1921. A résumé of a report of C. A. Emerson, Jr., Chief Engineer of the Pennsylvania Dept. of Health. A citizen of West Grove, Pa. died after an illness of a few hours and a coroner's jury after hearing the testimony of the attending physician, which included the fact that the decedent had drunk copiously of the chlorinated water from the public water supply, rendered a verdict that the death was caused by "general systemic debility caused by chemicalized water which produced a severe gastroenteritis followed by cardiac failure." The Commissioner of Health of Pennsylvania ordered the body to be disinterred and a postmortem made. The finding of the autopsy and a rehearing of the evidence relative to the death, resulted in the coroner's jury bringing in a supplemental report as follows: "That chlorine was neither directly nor indirectly the cause of death; that death was due to acute dilatation of the heart sequential to the loss of bodily fluids incident to a severe attack of toxic gastroenteritis with complicating extensive cardio-vascular and renal degeneration." The evidence showed that over-exertion was the real cause of the death and that the decedent would have had to have drunk two quarts of the public water supply to have received even 1/80th of an addiional dose.—*E. S. Chase*

Typhoid Fever Epidemic in Jacobstown, Burlington County, N. J. Public Health News, N. J., 6, 10, September, 1921. An account of a typhoid fever epidemic of 186 cases among about 400 persons who attended a Harvest Home Supper. The infection was contracted as a result of eating chicken salad served at the supper. The manner in which the salad was infected was not determined. This epidemic indicates the high ratio of cases to exposures (1 : 2) resulting from a typhoid infection of food, compared with that of one of the severest water-borne epidemics, that of Plymouth, Pa., when the ratio of cases to that of exposed population was about 1 : 8.—*E. S. Chase.*

State Board of Health of Rhode Island, Bull. 8, 2. Water Supplies Number, June, 1921. This bulletin deals with the activities of the State Board of Health in safeguarding the public water supplies of Rhode Island. This work, carried out by the Division of Chemistry and Sanitary Engineering, Mr. S. de M. Gage, Director, consists of monthly analyses of all surface waters and some of the ground water supplies, together with bimonthly analyses of certain of the more important filtered supplies. There are 61 points from which samples are obtained for examination. Inspections are made yearly of all water supplies and at least once a month of all water filter plants. Reports and advice are given to the local authorities in charge of water supplies, and special studies and investigations are made upon request. This work is not carried out under specific legal authority and there is no compulsion for water works officials to carry out the recommendations of the Board.

All of the cities and 23 of the 33 towns in the State are provided with public water supply systems, so that appr0ximately 90 per cent of the entire population have access to public water supplies, while the remaining 10 per cent, or 60,000, are dependent upon private wells, springs, etc., many of which are undoubtedly of questionable sanitary quality. It is interesting to note that 7 of the 10 towns without public water supplies are over 1000 in population. Another interesting fact is that only four of the public water supplies are owned by the municipalities they serve.

The water consumption of those places for which there are records, range from a minimum of 33 gal. per capita daily in two strictly domestic supplies, to 210 gallons per capita daily where four-fifths of the water pumped is used for manufacturing, and one supply of a mill town has a consumption of 360 gallons per capita daily. The average consumption per capita for the entire population served, was 82 gallons per capita daily. This bulletin describes in a general way the facts to be considered in basing judgment on the character of water supplies, and concludes with a comparatively detailed description of the various public water supplies of the state. No analyses, however, accompany these data.—*E. S. Chase.*

Sacramento Water Supply. J. R. SNEIDER. American Jour. Pub. Health. **11**, 25, 11. November, 1921. The Sacramento River, with a drainage area of 23,400 square miles, has been the principal source of water supply for Sacramento City, since 1850. In the early years the supply was relatively free from contamination, but mining, agriculture and summer visitors upon the watershed have resulted in considerable contamination and marked deterioration in the physical quality of the river water. Typhoid fever has been prevalent. The average death rate 1891 to 1914 was 53.5 per hundred thousand. Since 1915 when the chlorination plant was installed, but 9 cases have been traced to the water supply. This paper, however, does not give the actual death rates since 1915.

Rice cultivated in the valley above the city, has affected seriously the quality of the water, due to drainage from rice fields, and the quantity has also been impaired due to the use of the stream for irrigation and the consequent exposure of large voumes of water to rapid evaporation. During 1920 the river was so low that sewage from the city, discharged below the water works intake backed up at high tide as far as the intake. The danger from such sewage contamination was minimized to some extent by operating the pumps at such time of tides so as to obtain water not affected by the tide-carried sewage from the city. A filtration plant for additional protection to the supply is to be built.—*E. S. Chase.*

Pipe Extension Charges. NICHOLAS S. HILL, JR. Jour. New England Water Works Assoc. **35**, 2, June, 1921. This paper of Mr. Hill's deals with the problem of making fair charges for pipe line extensions. In brief he states that the charge which must be made for pipe extensions so that a waterworks may be reasonably reimbursed will equal a fair return, interest, taxes and the cost of maintenance of the extension proper.

(b) The extension's proportion of the gross fixed service or static fixed charges on the entire plant. The proportion of the gross fixed charges of the entire plant chargeable to fixed service or static cost, varies from 30 per cent to 50 per cent of the fair return, taxes and depreciation on the entire plant.

(c) The extension's fair proportion of the fixed service or static operating expenses of the entire plant. The operating expenses chargeable to fixed service or static costs, vary from 15 per cent to 40 per cent of the operating cost of the entire plant.

The rule for determining the proper charge for an extension is stated by Mr. Hill as follows:

1. Ascertain the cost of the extension.
2. Determine the annual cost of the extension, including:
   (a) Fair return on the cost of the extension.
   (b) Taxes on the extension.
   (c) Depreciation on the extension.
   (d) Maintenance on the extension.
3. Take from 20 per cent to 40 per cent of the gross cost of service (gross cost of service equals fair return, taxes, depreciation, reserve, and operating expenses) as the proper portion chargeable to fixed service or static costs.
4. Divide the total fixed service or static cost by the number of inch-feet in the distribution system to determine the proper fixed service or static charge per inch-foot of main.
5. Multiply the number of inch-feet in the proposed extension by the fixed service or static charge per inch-foot as determined to ascertain the fair proportion of fixed service or static costs which should be allocated to the extension.
6. Add the fixed service or static charge for the extension to the costs chargeable to the extension proper to obtain the total annual costs chargeable to the extension.

Mr. Hill also discusses the various ways in which the consumer may pay for the cost of the extension. Among the various ways in which the consumer may pay the costs are the installment plan, the entire cost on the first payment, the deposit of a sum equal to the estimated annual charges for a ten-year period, and a guaranty of revenue to meet the annual charges on the extension. Mr. Hill also takes up the matter of deduction from the charges due to revenues from fire protection service. In the discussion of this paper the methods employed in various of the New England cities were brought out.—*E. S. Chase.*

Relations between Plumbers and Water Works Superintendents. J. Wilbur Thompson. Jour. N. E. W. W. A. 35, 2, June, 1921. This paper comprises a general discussion of the advance in standards of sanitation and plumbing, with some reference to the effect of different waters upon water pipes in residences. Following the paper is a discussion of pressure and temperature relief valves on hot water piping, and the danger of explosion resulting from overheating of hot water boilers is pointed out.—*E. S. Chase.*

Need of Uniformity in Plumbing Regulations. George C. Whipple. Jour. N. E. W. W. A. 35, 2, June, 1921. This paper deals in a general way with the need for uniform plumbing regulations. He proposes minimum requirements of universal application, and rules and regulations to be adopted in whole or in part by local authorities.—*E. S. Chase.*

Water Distribution in Connection with Plumbing and the Action of Water on Metal. David A. Heffernan. Jour. N. E. W. W. A. 35, 2, June, 1921. A brief account of some trouble with stoppages in lead service pipe at Holyoke, Mass.—*E. S. Chase.*

Discussion of R. S. Weston's Paper. Geo. C. Bunker. Lead Poisoning by Water. Jour. N. E. W. W. A. 35, 2, June, 1921. This discussion gives an account of experiments carried out in 1918 and 1919 upon the solvent action upon lead pipe of the water supply of Gatun, Canal Zone. This water supply of Gatun is supplied by impounding the run-off from a watershed of 1,119 acres. It is treated with sulphate of alumina, aerated, passed through sedimentation basins, treated with lime, filtered through rapid sand filters and disinfected with liquid chlorine. The chemical characteristics of the water are quite variable. In particular the alkalinity ranged in a period of 5 years from 13 to 21 p.p.m. and the soap hardness from 6.3 to 26 p.p.m., while the color ranged from 10 to 152 p.p.m. Lime had been used since 1916 in order to take care of alum used for the decolorization of the supply. It was not found feasible to neutralize, however, all free CO_2 by soda ash.

In order to determine the action of the filtered water upon lead, a piece of new 1-inch lead pipe, 25 feet in length was so connected that the filtered water ran through it at a rate of approximately 1 gallon per minute for nine hours and remained without circulation for the remainder of each day. The experiment extended from February, 1918, to August 10, 1919. Samples at ten days intervals were collected, of water standing over night, and of the running water. During the first ten days lead was determined daily and in the overnight samples the lead increased from 0.15 p.p.m. in the first sample to 0.65 p.p.m. in the fourth, and decreased to 0.50 p.p.m. in the tenth. In the running samples the lead increased from 0.13 p.p.m. on the first day to 0.37 p.p.m. on the fourth, and decreased to 0.12 p.p.m. on the tenth. Of subsequent samples the lead content in over-night samples ranged from a minimum of 0.7 p. p. m. to a maximum of 1.20 p.p.m., while in the running samples, the lead content ranged from 0.7 p.p.m. to a maximum of 1.10 p.p.m.

At the end of the experiment the interior of the pipe was examined and found to contain a very thin light coating, too thin to prevent continued action of water upon the lead pipe.

Aeration would increase the dissolved oxygen content, and, in Mr. Bunker's opinion, increases the corrosive action of water on lead pipe, and although free carbonic acid was removed from water passing through the pipe corrosive action was not stopped. Mr. Bunker attributes this fact to the low hardness and alkalinity, rather than to the rather high dissolved oxygen content, which overcame the restraining effect of hydoxyl ions, lime being applied in amount ranging from about 30 to 60 pounds per million gallons.

Mr. Bunker made another experiment by exposing small pieces of sheet lead to the action of different waters for periods of one and seven days. The results of these experiments are given in condensed form in a table in his paper. In the case of the Agua Clara supply it was found that a carbonate alkalinity of 2.4 p. p. m. produced by the addition of lime must be maintained in order to keep the lead content of water used in the houses below 0.1 p. p. m. In these experiments the greatest action was shown by neutral distilled water which dissolved 185 p.p.m. in one day and 500 p.p.m. in seven days. Water from the Agua Clara supply which had been settled but to which no lime had been added, dissolved 5.0 p.p.m. one day and 9.5 p.p.m. in seven days. Although no ill effects have been recognized by Mr. Bunker in the use of the Canal waters, it is his opinion that the installation of lead services in the Gatun District should be discontinued. Traces of residual chlorine did not increase lead solvency. Mr. Bunker suggests that dissolved lead in water supplied to houses may be of greater public health significance than has been generally appreciated.—*E. S. Chase.*

The Flush Valve. Gordon M. Fair. Jour. N. E. W. W. A. 35, 2, June, 1921. This paper deals with the sanitary, economic and hydraulic factors in connection with the use of automatic quick opening and slow closing flush valves. The results of tests of rate of discharge and quantities discharged, together with observations as to water hammer, with several types of flush valves, are given in detail and discussed. The conclusions arrived at are as follows:

1. Unless carefully placed in a well-designed distributing system the use of the flush valve may result in contamination of the water supply,
2. There is little reason to believe that water will be conserved by the use of the flush valve,
3. The installing of flush valves is only economical in large buildings,
4. The effect of the use of the flush valves on water metering and water hammer, needs investigation,
5. The choice of the type of distributing system should be made only after the type of flush valve that will be used, has been determined.—*E. S .Chase.*

Report of Committee on Rainfall and Run-off Measurements. Robert E. Horton, Chairman. Jour. N. E. W. W. A. 35, 2, June, 1921. This report brings down to date the records of previously published rainfall and run-off data of New England drainage areas, together with additional records of the yields of similar water works drainage areas in New England and New York. The data are accompanied by information regarding matters affecting the accuracy of the records and the yield of the basins. No attempt is made by the committee to analyze or make deductions from these records. The report recommends that the water works superintendents throughout New England maintain at least one rain gage and that where maintained daily records of run-off and precipitation be published each year.

References are also given to records of evaporation from water surfaces.

In the discussion of this report the question was raised as to the effect of different kinds and intensities of vegetation upon watershed evaporation and yields.—*E. S. Chase.*

Cast Iron Pipe,the Method of Manufacture and its Inspection: Wm. R. Conard. Jour. N. E. W. W. A. 35, 3, September, 1921. Description of manufacture and inspection of cast iron pipe. Deals with requirements of the iron, the making of the mold, casting, cleaning, coating and testing of cast iron pipe. The desirability of research work relative to the best type of pipe coating is emphasized in the paper itself and in the discussion of the paper.—*E. S. Chase.*

Rainfall in New England. X. H. GOODNOUGH Jour. N. E. W. W. A. 35, 3, September 1921. This paper presents tabulation of rainfall records in New England together with similar records for stations in adjacent parts of New York and Canada for the years 1913 to 1920 inclusive, these records being a continuation of records given in a previous paper published by Mr. Goodnough in the Journal of New England Water Works for September 1915. The records of many new stations which have been established subsequent to the earlier paper are given as well as a few long records of observation not previously published.

Mr. Goodnough states that from inspection of a large number of rain gages, the standard 8-inch rain gage properly cared for appears to furnish the most reliable observations. The difficulty of measuring snowfall in any way is pointed out.—*E. S. Chase.*

Argument Against Boating and Fishing in Water Supply Reservoirs. Jour. N. E. W. W. 35, 3, September, 1921. A letter sent to the Governor of Massachusetts by the officers and past presidents of the New England Water Works Association requesting him to veto a bill which would have allowed boating and fishing in Lake Cochituate, a reservoir of the Metropolitan Water Works System.—*E. S. Chase.*

New Mobile Water Purification Unit. Eng. & Cont. 56, 6. [cf. Military Engineer, July–August 1921.] August 10, 1921. This article describes a water purification unit of the type used by the U. S. Army for supplying pure drinking water to mobile forces in the field. This outfit was developed by the office of the Chief of Engineers in collaboration with Wallace Tiernan Co. Inc. of New York.

This equipment is mounted on a 3½ ton Class B. Army truck. It consists essentially of a single centrifugal pump delivering one hundred gallons per minute against a 75 foot head at 1150 r. p. m. A direct connected 4 cylinder gasoline engine delivering about 25 H. P. at 1150 r. p. m.; a 42-inch pressure mechanical filter with a hand agitator, a 5-way control valve, a combination direct dry feed and solution feed chlorinator, with a capacity of $\frac{1}{10}$ to 12 pounds of chlorine per 24 hours, an alum pot and a soda ash tank with appropriate feeds, a venturi meter and a water meter, and a simple laboratory for making acidity, alkalinity, color, turbidity and free chlorine tests.—*E. S. Chase.*

Notes on Water Filtration. GEORGE MITCHEL. Eng. & Cont. 56, 9, August 31, 1921. [cf. Proc. Inst. Wat. Eng. London 1920] Mr. Mitchell states that any water can be successfully treated by mechanical filters without coagulation, provided chlorination follows. These filters are of value prior to slow sand filtration. An experiment with preliminary filtering through rapid sand filters of a relatively clear raw water, as at Aberdeen, show that a slow sand filter treating prefiltered water passed 1,530,000,000 gallons per acre without requiring cleaning. Compared with the necessity of sixteen cleanings of a check filter treating the same amount of water without prefiltering. Higher rates of slow sand filtration are feasible, as is shown by the fact that at Aberdeen the average rate of filtration has been 3,500,000 gallons per acre per day, which, however, at times has been exceeded. The bacteriological results have invariably shown the absence of B. coli in 100 cc. inoculation, and in a 13 months' period not a case of typhoid fever occurred in a population of 170,000 supplied by the water.

In resanding the author thoroughly rakes the old sand with long-toothed rakes, putting on washed sand and finishing up with 1 inch of old sand.

A system of cleaning devised by Mr. Caink of Worcester, England, is as follows: The water having been lowered to about sand level, the mud is squeegeed off with the assistance of a stream of water, the muddy water being removed by a channel sunk in the sand. There after the water is lowered about a foot, and a light harrow is passed over the sand, which is at the same time rolled. The filter is then ready for use again. This is repeated for a long period—in some cases over two years—when a thickness of about 4 inches of dirtiest sand is removed, washed and restored to the filter.

This method of cleaning is supposed to have the advantage of providing a comparatively thick film of fresh sand and a correspondingly greater efficiency. The thickness of the sand remains constant and there is a large economy in working expenses and a considerable increase in output per unit of area.—*E. S. Chase.*

Wells and Ground Water. Eng. & Cont. 56, 9, August 31, 1921. [cf. Engineering, London.] Percolation of the supply to the ground water depends on the rainfall, porosity of strata pierced through and extent of exposed surface. It varies inversely with the soil evaporation; is greatest in winter and during heavy long-continued rains; it is least in summer with short showers of rain. The deficiency of ground water will be felt most towards the close of a long dry season where the reserve of water furnished by the rains of the preceding rainy season have been reduced to their lowest limit, by the demands of the dry months. A failure of rain, or scanty rainfall during the rainy season is therefore more likely to cause a diminution of ground water, or a drought, than a long dry summer.

This article also gives certain data regarding the influence of depth of ground water on soil evaporation, and the results of various experiments on percolation and soil evaporation.—*E. S. Chase.*

Cavity Wells in India. Eng. & Cont. 56, 9, August 31, 1921. [cf. Engineering, London.] A description of a method employed in increasing the yield of wells by producing cavities in the water-bearing stratum at the bottom of the bore pipe, a method used in India with considerable success.—*E. S. Chase.*

Water Filtration in Madras. James Madeley. Eng. & Cont. 56, 9, August 31, 1921. [cf. Proc. Inst. Wat. Eng. London, 1920.] This article gives the results of operation of slow sand filters in tropical countries. The results of operation of slow sand filters are not so good under tropical conditions as would be expected in England. The deterioration in the results in Madras are attributed by Mr. Madeley to the breaking off of the filtering skin probably by frogs, crabs, fish and heavy rains, and by algae masses which break away and carry off portions of the filtering skin. Remedial measures consisting of guard walls, fine wire screens on filter inlets, and the maintenance of 3½ to 4 feet of water upon these filters, were fairly efficacious. Covering of the filters was thought beneficial providing a sufficient depth of water over the surface of the sand was maintained.

Experiments on the effect of storage and sunlight upon the bacterial content showed a marked decrease in bacteria during the first four days, with a maximum reduction being reached about the eighth day. No consistent advantage was shown by combined sunlight and storage over storage alone.

Mr. Madeley has decided that chlorination should be used to supplement filtration and proposes to increase the rate of filtration and supplement with chlorination.—*E. S. Chase.*

Electrically-Operated Valves at Buffalo, N. Y., Eng. & Cont. 56, 11, September 14, 1921. A description of the methods of electrical operation and control of large gate valves on the discharge line of the Buffalo pumping station. In order that the opening and closing of these valves for the most advantageous operation of the various pumping stations may be done at nominal expense.—*E. S. Chase.*

Some Problems Encountered by the Waterworks Engineer. W. C. Hawley. Eng. & Cont. 56, 11, September 14, 1921. An account of experiences with unusual problems dealt with in the operation of waterworks, including the emergency repair of a standpipe, the operation of an old plant while building a new one, and experience with earth slips.—*E. S. Chase.*

Apparatus and Chemicals for a Small Water Works Lab. Eng. & Cont. 56, 11, September 14, 1921. [cf. Bull. No. 16 Ill. State Water Survey Div.] This article gives a list of apparatus, chemicals and supplies recommended by the Illinois State Water Survey for the equipment of small water works laboratories in order to make the examinations described in Standard Methods of Water Analysis of the American Public Health Association.—*E. S. Chase.*

Underdrainage for Preventing Alkali Action on Winnipeg Aqueduct. Contract Record. August 17, 1921. An account of the methods employed to underdrain a section of the 8-foot reinforced concrete aqueduct of the greater Winnipeg water district in order to remove alkali drainage water which was found to be causing serious disintegration of the concrete.—*E. S. Chase.*

Prices of Waterworks and other Materials, Month by Month. Eng. & Cont. 56, 15, Oct. 12, 1921. A series of diagrams and tables of prices of various engineering materials, compiled in the office of Dabney H. Maury, consulting engineer, Chicago, Ill.—*E. S. Chase.*

Methods and Cost of Jacketing Steel Pipe Line with Reinforced Concrete. Eng. & Cont. 56, 15, October 12, 1921. [cf. Concrete, September, 1921.] This comprises a description of the successful use of reinforced concrete for jacketing the Dominguez Water Company, Los Angeles, California, for the protection of a steel pipe subject to the corrosion of an alkali soil. At the time the article was written some 6500 feet of 33-inch steel pipe had been protected by the reinforced concrete, at an average total cost per foot of $2.01.—*E. S. Chase.*

Handling Liquid Chlorine. D. K. Bartlett. Eng. and Cont. 56, 19, November 9, 1921. The increased use of chlorine gas for the textile and various other industries, and for public water supply systems, has resulted in the storing of chlorine in from 4000 to 5000 different points throughout the country, in quantities of from a few cylinders to many thousand pounds. The method of this storage of chlorine has been taken up very carefully by Mr. Bartlett in this paper. He points out that the escape of gas from a container may be due to either a true explosion, an increase of pressure due to heat, or to leaks, and if the gas escapes from the container the resulting danger may be due to inflammability, poisonous effects or to irritating effects upon the respiratory system. In the case of chlorine the danger of a true explosion is non-existent due to the fact that it is a non-explosive gas. Furthermore, the rupture of a cylinder resulting from a change or increase in temperature, is very slight. All cylinders and other containers are provided with fusible plugs which melt at 158° F., at which temperature the pressure is about one-half the test pressure of the drums at the time of manufacture, and a quarter of the pressure of the small cylinders. There has never been an instance of the bursting of a container in transit, or in user's plant.

In a few cases of fire where large quantities of chlorine have been in storage the upward draft due to the heat has been sufficient to carry the gas upward and cause a sufficient dilution so the the fire fighters were caused no inconvenience.

In the case of leaks the odor of the chlorine affords its own danger signal, so that reasonable care will prevent extensive trouble arising from leaks.

This paper continues with general and specific directions relative to the detection and elimination of sources of leakage, and describes first aid measures in the case of persons overcome by the gas.

The best methods for the shipment of chlorine in large quantities and for its storage after receipt are also discussed in this article.—*E. S. Chase.*